Physical Separation Treatability Study

Rocky Flats Operable Unit No. 2 Surficial Soil

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PHYSICAL SEPARATION TREATABILITY STUDY

ROCKY FLATS OPERABLE UNIT NO. 2 SURFICIAL SOIL

U.S. DEPARTMENT OF ENERGY
The Rocky Flats Environmental Technology Site
Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM DIVISION

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1.0 INTRODUCTION

1.1 SITE DESCRIPTION

1.1.1 Site Name and Description

Rocky Flats Environmental Technology Site (RFETS), a 6,550 acre industrial reservation is located in northern Jefferson County, Colorado. RFETS lies on two major geological units: unconsolidated surficial units (Rocky Flats Alluvium, various terrace alluvia, valley fill alluvium, and colluvium) underlain by Cretaceous bedrock (Arapahoe Formation, Laramie Formation, and Fox Hills Sandstone). Groundwater moves under confined conditions in surficial and shallow bedrock units. Additionally, confined groundwater flow occurs in deeper bedrock sandstones. Surficial soils are predominantly moderately deep to deep, well-drained clay loams of moderate to low permeability (*Final Phase II RCRA Facility Investigation Remedial Investigation, Work Plan [Alluvial]*, U.S. Department of Energy, Rocky Flats Office, Golden, Colorado, 29 February 1991).

1.1.2 History of Operation

From the mid-1950s to the present, RFETS has been a government-owned (U.S. Department of Energy [DOE]), contractor-operated facility that fabricated nuclear weapon components from plutonium (Pu), uranium (U), and other non-radioactive metals (principally beryllium (Be) and stainless steel). Plutonium was also recovered in the facility when it reprocessed components after they were removed from obsolete weapons.

1.2 WASTE STREAM DESCRIPTION

1.2.1 Production Wastes

Radioactive and nonradioactive wastes were generated in the production processes. Plant waste handling practices involved onsite and offsite recycling of hazardous materials, onsite storage of

hazardous and radioactive mixed wastes, and offsite disposal of solid radioactive materials at other DOE facilities. In the past, hazardous, radioactive, and radioactive mixed wastes were stored and disposed onsite. Primary assessments under environmental remediation programs have identified some of these storage and disposal locations as potential sources of environmental contamination.

1.2.2 Pollutants/Chemicals

The 903 Pad, located on the south eastern side of the plant, is a portion of Operable Unit No. 2 (OU2) and covers an area 113 meters wide by 120 meters long. In 1958, waste drums were stored at this location. Contaminated soil was first discovered in 1964 in an area where 210 liter drums of plutonium-laden lathe coolant oil were stored. The drums contained cutting oil and carbon tetrachloride contaminated with plutonium and uranium cuttings from nuclear weapons components machining operations.

By 1968, all of the drums had been removed, processed, and shipped offsite for disposal. The contaminated area was covered with a pad consisting of successive layers of fill dirt, gravel, and a final layer of asphalt. The level of contamination in the soil ranged between 2,000 to 300,000 disintegrations per minute (dpm)/100 square centimeters (cm^2), with penetration depths of 3 to 20 cm. The plutonium metal was originally deposited as fine metallics. It oxidized into PuO_2 in the environment. The average size of the PuO_2 particles was 0.2 microns (*Soil Decontamination Criteria Report*, J. A. Hayden, et al; Rockwell International, November, 1990).

1.2.3 Treatability Study Contaminants of Concern (COC)

For the purposes of this study, seven COC's were identified by the Colorado Department of Public Health and Environment (CDPHE) for investigation:

1) Arsenic (As)
2) Barium (Ba)
3) Beryllium (Be)
4) Cadmium (Cd)
5) Chromium (Cr)

6) Lead (Pb)
7) Selenium (Se)

1.2.4 Programmatic Risk-Based Preliminary Remediation Goals (PPRGs)

PPRGs for residential soil are from the July 1994 document of the same name. The values are presented in Table 1.2.4-1. The values are risk-based and, in this case, are calculated for a residential exposure scenario.

Table 1.2.4-1 Programmatic Preliminary Remediation Goals

Analyte	As	Ba	Be	Cd	Cr	Pb	Se
PPRG (MG/KG)	3.66 E-01	1.92 E+04	1.397 E+02	1.02 E-01	III:2.04 E+06 VI:4.88 E+03	Not Established[1]	1.37 E+03

[1]The Office of Solid Waste and Emergency Response (OWSER) of the EPA has recommended using the EPA Uptake Biokinetic (UBK) Model as a risk assessment tool to predict blood lead levels when predicting soil lead cleanup levels at CERCLA/RCRA sites (U.S. Environmental Protection Agency, Don R. Clay, *OSWER*, August 29, 1991). When the model is run with EPA's agency-wide lead strategy benchmarks, an acceptable soil level of approximately 500 ppm is predicted for the level of lead-cleanup in soil.

1.3 TREATMENT TECHNOLOGY DESCRIPTION

1.3.1 Treatment Process, Description, and Operating Features

A detailed description of the TRU-Clean® Process can be obtained from the March 31, 1993 report entitled, "Plutonium in Soils Treatability Studies Rocky Flats Plant Operable Unit 2", by T. K. Wenstrand and T. M. Murarik. This report describes all aspects of the Physical Separation Treatability Test, including operating features, performed by Lockheed Environmental Services and Technology (LESAT) of Las Vegas, Nevada on OU2 surficial soils which generated the residues sampled for this treatability study.

1.4 Previous Treatability Studies at the Site

In addition to the LESAT Report, another soils treatability study was reported in August, 1994 entitled, "Rocky Flats Plant Soil Treatment Bench-Scale Treatability Studies (Nuclear Remediation Technologies Division, General Atomics-San Diego, California, GA-C21818). This study reported on preliminary characterization, flotation/attrition scrubbing tests, and leaching tests.

2.0 CONCLUSIONS AND RECOMMENDATIONS

2.1 CONCLUSIONS

This physical separation treatability study investigated the performance of various gravity concentrating and size separating unit operations that comprise the TRU-Clean® Process. Overall, the TRU-Clean® process was ineffective in concentrating the seven COCs of interest. The most likely cause of the ineffectiveness was a lack of differences between the specific gravities of the COCs and the bulk of the remaining soil matrix. Although not specifically investigated, the results strongly indicate that the mineralogical specie were not a variety that were effectively concentrated using gravity concentrating devices. None of the size separation techniques were sufficiently effective either.

Overall, this treatability study found that the COCs did not concentrate when subjected to physical separation techniques. These results strongly imply that the COCs specified for the study were in the form of naturally occurring minerals. Had the COCs been placed into the environment as the result of plant operations, they would have probably been in metallic form. Furthermore, if the COCs had been in metallic form, the physical separation techniques employed here would have been effective due to the high density of metals versus the bulk soil.

2.2 RECOMMENDATIONS

2.2.1 Mineralogical Investigation

Some mineralogical evaluation of surficial soils is warranted to aid future recommendations with regard to remediation investigations.

2.2.2 Pilot Study

Previous soils studies have focused on removing radionuclide contamination. Should a pilot plant study be conducted to remove radionuclides, the recovery of identified mineral COCs could be accomplished concurrently.

3.0 TREATABILITY STUDY APPROACH

3.1 TEST OBJECTIVES AND RATIONALE

The objective of this study was to determine the ability of the unit operations employed in the LESAT Treatability Study as a remedial technology for the removal of the seven identified COCs in the form of elements of unknown mineralogy. The technology had previously been evaluated for its ability to remove radionuclide contamination from samples of RFETS soil. The rationale for this study was to expand this investigation to include the mineral COCs. Specifically, this study was initiated at the request of the CDPHE in correspondence dated February 18, 1994 to DOE/RFFO.

A Physical Separation Treatability Test was conducted by LESAT of Las Vegas, Nevada. Samples of soil residues from that test were used for this treatability study. Details of the LESAT Program can be obtained from the March 31, 1993 Report, "Plutonium in Soils Treatability Studies Rocky Flats Plant Operable Unit 2," by T.K. Wenstrand and T.M. Murarik. Since that formal report has been submitted to the Rocky Flats Field Office (RFFO) (NMH-065-94), it will be used as a reference, but not quoted in full. However, the *Integrated System for Treatability Study* diagram (See Fig. 4.1.7 from the LESAT Report) is reproduced in this report (See Fig. 3.1-1). This diagram can be used to compare the results presented in the following sections.

Samples were taken of identified feed and product streams to be used for evaluation of the following physical separation technologies:

- Trommel Screen
- Spiral Classifier
- Attrition Scrubber
- Gravimetric Separator
- Hydrocyclone
- Centrifugal Concentrator

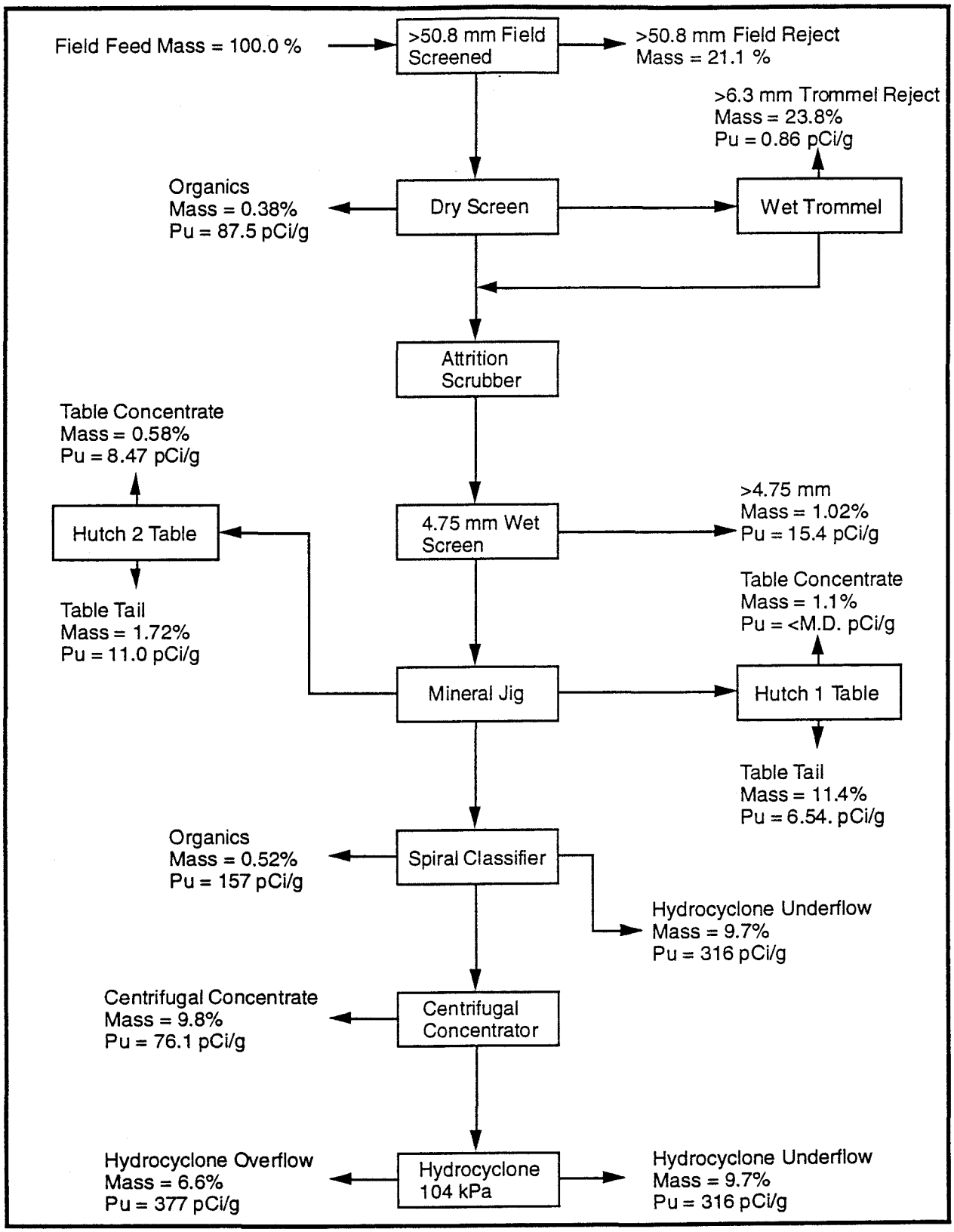

Figure 3.1-1 Integrated System for Treatability Study

The multiple gravity separator identified by CDPHE to be analyzed in this study was omitted in the original LESAT Study. The hydrocyclone, however, was run and is included in this study.

Since the soils residue samples required repacking per RFETS waste procedures, a waste resampling and repacking plan was developed for this study. The Permacon, a controlled environmental facility located in Tent 10 on the 903 Pad, was used for this purpose. Samples were taken of the identified product streams and shipped to an offsite analytical facility for metals analyses.

3.2 Sampling and Analysis

Sampling was conducted according to RFETS procedures L-3306-A, *Waste Characterization Sampling Procedure Inside the Protected Area* (Effective Date 12/11/91); and L-6245-E, *Sampling Procedure for Waste Characterization* (Effective Date 4/20/94).

Chemical analyses were conducted by Lockheed Analytical Services (LAS-Las Vegas, Nevada). EPA Procedure 6010 using Inductively Coupled Plasma (ICP) was used to detect barium, beryllium, cadmium, and chromium. EPA Procedure 7000, *Graphite Furnace Analysis*, was used to detect arsenic, selenium, and lead.

4.0 RESULTS AND DISCUSSION

4.1 DATA ANALYSIS AND INTERPRETATION

4.1.1 Analysis of Waste Stream Characteristics

This study focuses on the response of minus 50.8 mm soil to the identified unit operations. The original LESAT Study blended multiple drums of OU2 surficial soils to generate a composite feed material. An analytical aliquot was split out of that composited material. The results of that analysis represent the waste stream used as feed and investigated for this study. These values are compared to the PPRGs and the Rock Creek Study data (See Table 4.1.1-1). The Rock Creek Drainage Background Study is important to the Background Soils Characterization Plan (BSCP) and this study because it provides comparative values for the COCs.

> Samples were collected in 1992 and 1993 from the Rock Creek Drainage Area (the Rock Creek data set) in the northwest quadrant of the buffer zone of RFETS. This data was collected in support of the Resource Conservation and Recovery Act /Comprehensive Environmental Response, Compensation and Liability Act (RCRA/CERCLA) investigations for OU1 and OU2 to establish a background soil chemistry for determining the nature and extent of contamination, and for human health risk-assessment purposes (*Background Soils Characterization Plan*, RFETS/ER-M-94-00022, May 1994).

The LESAT Feed values were consistently below the Rock Creek background values. The values for beryllium, cadmium, and chromium were an order of magnitude lower. The PPRG for arsenic at 0.366 MG/KG was an order of magnitude lower than the corresponding LESAT value of 3.5 MG/KG. The beryllium value of 0.63 MG/KG was also higher than the PPRG value of 0.149 MG/KG. The remaining LESAT values were consistently lower than the PPRGs, some were several orders of magnitude lower. Beryllium had been previously identified as a target contaminant in soils (Final Treatability Studies Plan [TSP], Section 5.2.1, August 26, 1991). Arsenic was not identified as a target contaminant in the TSP. When the LESAT Feed material

from OU2 was compared, it was questioned whether there was a metals COC issue in light of all values found to be less than background.

Table 4.1.1-1 LESAT Feed, PPRGs, and Rock Creek Study Soil Analyses

Analytes in MG/KG							
Description	As	Ba	Be	Cd	Cr	Pb	Se
LESAT Feed	3.5	102	0.63	0.78	8.5	26.9	0.47
PPRG	0.366	19020	0.149	137	4880[1]	500[2]	13700
Rock Creek[3]	5.79	199.7	1.55	1.35	15.21	37.62	0.60

[1]Value for Cr+6, Value for Cr +3 = 2,040,000
[2]Value Derived from EPA Uptake Biokenetic Model as Described in Footnote 1 of Table 1.2.4-1.
[3]Table 3-9, Section 3.0, Page 18 of 25, Background Soils Characterization Plan, RFP/ER-M-9400022, May 1994.

4.1.2 Analysis of Treatability Study Data

Metallic concentrations for the process streams produced as a result of the investigated LESAT unit operations are shown in Table 4.1.2-1. Consistent with the results presented in Section 4.1.1, arsenic and beryllium were above their respective PPRGs by up to two orders of magnitude. The remaining five metal COC were under their respective PPRGs which was also consistent with the results in Table 4.1.2-1. This data indicated that barium, cadmium, chromium, lead, and selenium were under their respective PPRGs and were not considered to be COCs. Arsenic and beryllium concentrations were above their PPRGs, however, when the untreated feed material (i.e., LESAT Feed) was considered. Arsenic and beryllium COC concentrations were below the background (Rock Creek) which indicated that arsenic and beryllium were not COCs.

4.1.2.1 Mass Balance for Overall Process—Table 4.1.2.1-1 provides individual metal mass balances around the overall process flow diagram shown in Figure 3.1-1. It should be noted that the product mass values shown in Figure 3.1-1 are taken from the LESAT Report.

Table 4.1.2-1 Unit Operations Stream Concentrations

Description	Product Mass-%	As MG/KG	Ba MG/KG	Be MG/KG	Cd MG/KG	Cr MG/KG	Pb MG/KG	Se MG/KG
Programmatic Risk-Based Preliminary Remediation Goals		3.66 E-01	1.902 E+04	1.49 E-01	1.37 E+02	III:2.04 E+06 VI:4.88 E+03	Not Est.[1]	1.37 E+03
Dry Screen Organic	0.38	62.1	128	0.60	1.4	11.0	56.5	1.3
Dry Screen-Oversize	Internal Stream	59.8	113.3	0.27	0.77	3.0	16.6	0.66
Dry Screen-Undersize	Internal Stream	61.9	112	0.78	0.80	12.2	37.5	0.90
Trommel-Oversize	23.8	17.1	7.4	0.02	0.80	0.99	8.4	22.5
Trommel-Undersize	Internal Stream	61.8	73.2	0.42	0.80	8.2	55.0	0.78
Wet Scrn Oversize (>4 Mesh)	1.02	17.3	59.0	0.31	0.81	6.5	25.1	22.8
Hutch 1 Table Concentrate	1.1	17.2	21.3	0.29	0.80	4.5	377	22.6
Hutch 1 Table Tailing	11.4	17.3	12.7	0.20	0.80	2.3	10.9	22.7
Hutch 2 Table Concentrate	1.72	17.3	14.5	0.20	0.80	3.3	18.8	22.7
Hutch 2 Table Tailing	0.58	61.4	74.3	0.38	0.79	10.9	17.0	0.60
Classifier Cleanout (Org)	0.52	17.1	23.7	0.20	0.80	2.8	25.3	22.5
Classifier Underflow	12.2	17.3	18.5	0.20	0.80	2.3	8.4	22.7
Centrifugal Concentrate	9.8	22.5	191	1.1	1.0	28.8	84.9	22.7
Hydrocyclone Overflow	6.6	17.2	241	1.5	1.1	34.4	111	22.6
Hydrocyclone Underflow	9.7	17.3	219	1.4	1.3	30.3	93.3	22.7

Note: In Table 4.1.2-1, the sum of the product streams equals 78.8%. The >50.8 mm material rejected in the field accounted for 21.1% for a total mass balance of 99.9%.

[1]The Office of Solid Waste and Emergency Response (OWSER) of the EPA has recommended using the EPA Uptake Biokinetic (UBK) Model as a risk assessment tool to predict blood lead levels when predicting soil lead cleanup levels at CERCLA/RCRA sites (U.S. EPA, Don R. Clay, OSWER, August 29, 1991). When the model is run with EPA's agency-wide lead strategy benchmarks, an acceptable soil-level of approximately 500 ppm is predicted for level of lead-cleanup in soil.

Individual values for metals were calculated by multiplying individual mass values from Figure 3.1-1 with the analytical values provided in Table 4.1.2-1. Those values were summed for a given metal and then individual percentages were derived for each unit operation (i.e., centrifugal concentrate). In this way, the overall distribution and behavior of a given metal can be tracked through the individual unit operations and overall process used in the Lockheed Treatability Study.

Table 4.1.2.1-1 Mass Balance Values in Percent

Description	Product Mass-%	As %	Ba %	Be %	Cd %	Cr %	Pb %	Se %
Dry Screen Organic	0.38	1.3	22.8	5.9	13.1	7.9	4.1	0.3
Trommel Oversize	23.8	22.1	0.4	0.1	0	0.5	0.1	0.9
Wet Screen Oversize	1.02	1.0	2.9	1.4	0	2.9	1.1	2.6
Hutch 1 Table Concentrate	1.1	1.0	1.1	0.5	0	2.1	11.2	38.7
Hutch 1 Table Tailing	11.4	10.7	0.6	0.2	0	1.1	0.2	1.1
Hutch 2 Table Concentrate	1.72	1.6	0.7	0.2	0	1.6	0.4	1.9
Hutch 2 Table Tailing	0.58	2.0	13.1	2.2	0	4.8	1.2	0.1
Classifier Organic	0.52	0.5	1.2	0.4	0	1.1	0.5	2.6
Classifier Underflow	12.2	11.4	0.9	0.3	0	1.1	0.1	0.9
Centrifugal Concentrate	9.8	12.0	12.3	16.2	13.1	15.3	16.1	8.8
Hydrocyclone Overflow	6.6	6.2	11.9	27.9	26.3	20.1	25.2	11.4
Hydrocyclone Underflow	9.7	9.1	10.8	23.6	26.3	20.6	18.7	9.60
SUMS[1]	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8

[1]These sums and calculations are based on the minus 50.8 MM material and do not include the plus 50.8 MM material that was field screened and set aside as field reject. The plus 50.8 MM material accounted for 21.1% which, when summed with the material inventoried, results in 99.9% accountability.

The minus 50.8 MM (2 in.) material accounted for 78.8 percent of the total material. The remainder of the material was rejected in the field during sampling. The trommel oversize mass of 23.8 percent was the largest portion of the minus material, accounting for some 30 percent of the

total. The remaining process streams varied from 0.38 to 12.2 percent with no pattern to the distribution of mass.

In addition, there was no pattern to the metals distribution. When 20 percent or more was used as the cutoff for a "significant" distribution of material to any process operation, there were few minerals which were successfully concentrated. The trommel oversize had 22.1 percent of the arsenic; the dry screen had 22.8 percent of the barium; the hydrocyclone overflow contained 27.9 percent of beryllium, 26.3 percent of the cadmium, 20.1 percent of chromium, and 25.2 percent of lead. The Hydrocyclone underflow contained 23.6 percent of the beryllium, 26.3 percent of the cadmium, and 20.6 percent of the chromium. These latter analytical values indicate that the values are split between the hydrocyclone underflow and overflow.

Although the hydrocyclone overflow had four metals in the plus 20 percent category, when compared to the hydrocyclone underflow, which had three (nearly four as lead was 18.7 percent) metals in the plus 20 percent, there was essentially no difference between the concentrated and tailings streams and no significant concentration of values.

However, the material reporting to the hydrocyclone underflow was the smallest in particle size and should have had the highest concentration of all metals throughout. A classic metallurgical relationship exists among particle size, particle density, and metals concentration. As particle size decreases, particle density and metals concentration increases. That anticipated mineral behavior was not observed here. One explanation for this not being the case is that the COCs were not in a mineralogical form wherein the gravity concentrating unit operations were effective.

This behavior may be attributed to the nature of the treatability study because the unit operations were not run in a process string configuration where one unit operation provided the feed to the next unit operation on a continual basis. Material was fed on a batch basis from one unit operation to the next. The test was not conducted in a process string mode, thus equilibrium was never achieved. Batching the material through one unit operation at a time does not achieve equilibrium distribution of minerals and particles.

Overall, no clear concentration of metals was found in any unit operation. The distribution of metals for individual unit operations is discussed in the following sections.

4.1.2.2 Distribution of Metals for Individual Unit Operations—The following sections provide analytical and mass distribution data for each of the unit operations conducted in the treatability study.

4.1.2.2.1 Dry Screen Results—Table 4.1.2.2.1-1 shows selected data for the dry screen unit operation. Although not specifically identified as one of the unit operations for analysis, the results for the dry screening operation are presented for overall evaluation. The undersize material contained between 69 to 89 percent of the analyzed metals which followed the 69 percent of the mass that reported to this fraction.

Table 4.1.2.2-1 Dry Screen Results

Analyses MG/KG	As	Ba	Be	Cd	Cr	Pb	Se	Stream Fraction
Oversize	59.8	113.3	0.27	0.77	3.0	16.6	0.66	
Undersize	61.9	112.0	0.78	0.80	12.2	37.5	0.90	
Organic	62.1	128.0	0.60	1.4	11.0	56.5	1.3	
Distribution								
Oversize, %	29	30	13	29	10	16	24	0.30
Undersize, %	70	69	86	70	89	83	75	0.69
Organic, %	1	1	1	1	1	1	1	0.01

4.1.2.2.2 Wet Trommel Results—Table 4.1.2.2.2-1 shows selected data for the wet trommel unit operation. This data indicated significant concentrations of all minerals, except selenium, in the undersize fraction. However, this apparent concentration effect was due to 70 percent of the mass reporting to the undersize fraction rather than a true concentration effect. Selenium showed an anomalous behavior as 92 percent of the selenium reported to the oversize. This result was not anticipated because minerals are typically concentrated in the finer sized fractions.

Table 4.1.2.2.2-1 Wet Trommel Results

Analyses MG/KG	As	Ba	Be	Cd	Cr	Pb	Se	Stream Fraction
Oversize	17.1	7.4	0.20	0.80	0.99	8.4	22.5	
Undersize	61.8	73.2	0.42	0.80	8.2	55.0	0.78	
Distribution								
Oversize, %	11	4	17	30	5	6	92	0.30
Undersize, %	89	96	83	70	95	94	8	0.70

4.1.2.2.3 Attrition Scrubber Results—Feed to the attrition scrubber was a combination of wet trommel undersize and dry screen undersize. The product of the attrition scrubber was passed directly through to the wet screen. Samples were not taken of the attrition scrubber product so an analysis was not possible.

4.1.2.2.4 Wet Screen Results—Table 4.1.2.2.4-1 shows selected data for the wet screen unit operation. Wet screening results indicated that the COCs followed 98 percent of the mass that reported to the undersize. There was essentially no selective concentration that took place when the feed material was compared to the undersize on a metal by metal basis.

Table 4.1.2.2.4-1 Wet Screen Results

Analyses MG/KG	As	Ba	Be	Cd	Cr	Pb	Se	Stream Fraction
Feed Material (Attrition Undersize)	19.61	106.48	0.70	0.94	14.85	55.13	22.0	
Oversize	17.3	59.0	0.31	0.81	6.5	25.1	22.8	
Undersize	19.65	107.37	0.71	0.94	15.01	55.69	22.0	
Distribution								
Oversize, %	2	1	1	2	1	1	2	0.02
Undersize, %	98	99	99	98	99	99	98	0.98
Note: The shaded areas indicate that the data was calculated for each analyte from the weighted averages of all products.								

4.1.2.2.5 Gravity Separation (Mineral Jig) Results—Table 4.1.2.2.5-1 shows selected data for the mineral jig unit operation. Most of the metals subjected to the action of the mineral jig followed 72 percent of the mass that reported to the undersize. There was essentially no selective concentration that took place especially when the feed material was compared to the undersize on a metal by metal basis.

Table 4.1.2.2.5-1 Mineral Jig Results MG/KG

Analyses MG/KG	As	Ba	Be	Cd	Cr	Pb	Se	Stream Fraction
Feed Material (Wet Screen Undersize)	19.7	107.4	0.71	0.94	15.01	55.69	22.0	
Mineral Jig Oversize[1]	22.4	20.5	0.23	0.80	3.49	39.13	20.16	
Mineral Jig Undersize[2]	18.6	140.5	0.9	1.0	19.4	62.0	22.7	
Distribution								
Oversize, %	31	5	9	23	6	19	25	0.28
Undersize, %	69	95	91	77	94	81	75	0.72

[1]The oversize portion of the minerals jig contains the more dense mineral particles.

[2]The undersize portion of the minerals jig contains the less dense mineral particles.
Note: The shaded areas indicate that the data was calculated for each analyte from the weighted averages of all products. In this instance, all values were calculated as no individual streams were analyzed.

4.1.2.2.6 Gravity Separation (Table) Results—The two hutch concentrates from the jigging operation were individually subjected to gravity concentration through the use of a tabling operation. Table 4.1.2.2.6-1 shows selected data for the tabling unit operation. With the exception of lead, in the table concentrate from Hutch 1 feed, the remaining metals followed the 78 percent of the mass that accounted for Hutch 1 Tailing. Since tabling was a gravity concentrating unit operation, it was expected that minerals of higher density would selectively be concentrated in the table concentrates. The fact that most of the metals reported to the tailing for Hutch 1 was not expected. The analytical value of 377 MG/KG for lead was almost two orders of magnitude higher than the feed material value of 39 MG/KG. Somewhat anomalous results were seen for arsenic

and barium in the tailing for Hutch 2. Both of the analytical values were roughly three to four times higher than their feed values. Mineral specie typically do not concentrate in tailing streams.

Table 4.1.2.2.6-1 Table Results MG/KG

Analyses MG/KG	As	Ba	Be	Cd	Cr	Pb	Se	Stream Fraction
Feed Material (Mineral Jig Oversize[1])	22.36	20.49	0.23	0.80	3.49	39.13	20.16	
Table Concentrate Hutch 1	17.2	21.3	0.29	0.80	4.5	377	22.7	
Table Tailing Hutch 1	17.3	12.7	0.20	0.80	2.3	10.9	22.7	
Table Concentrate Hutch 2	17.3	14.5	0.20	0.80	3.3	18.8	22.6	
Table Tailing Hutch 2	61.4	74.3	0.38	0.79	10.9	17.0	0.60	
Table Concentrate Hutch 1	6	8	10	7	10	72	8	0.07
Table Tailing Hutch 1	59	47	67	78	50	21	87	0.78
Table Concentrate Hutch 2	3	3	4	4	4	2	5	0.04
Table Tailing Hutch 2	32	42	19	11	36	5	0	0.11

[1]The oversize portion of the minerals jig contains the more dense mineral particles.
Note: The shaded area indicates that the data was calculated for each analyte from the weighted averages of all products.

4.1.2.2.7 Spiral Classifier Results—Table 4.1.2.2.7-1 shows selected data for the spiral classifier unit operation. Spiral classifiers are processing devices used, in most applications, to make a size separation and concentrate materials. This data gave the impression that the spiral classifier concentrated in excess of 90 percent of the barium, beryllium, chromium, and lead into the classifier overflow. Although the classifier overflow analytical values for these metals were higher than their respective feed values, the concentration effect was more the result of the 68 percent pass value of the stream.

Table 4.1.2.2.7-1 Spiral Classifier Results

Analyses MG/KG	As	Ba	Be	Cd	Cr	Pb	Se	Stream Fraction
Feed (Mineral Jig Undersize)	18.6	140.5	0.87	1.0	19.4	62.0	22.7	
Overflow	19.2	199.8	1.2	1.1	27.5	87.7	22.7	
Underflow	17.3	18.5	0.20	0.80	2.8	8.4	22.7	
Organics	17.1	23.7	0.20	0.80	2.8	25.3	22.5	
Distribution								
Overflow, %	70	96	93	74	95	95	68	0.68
Underflow, %	29	4	7	25	5	4	31	0.31
Organics, %	1	0	0	1	0	1	1	0.01
Note: The shaded areas indicate that the data was calculated for each analyte from the weighted averages of all products.								

4.1.2.2.8 Centrifugal Concentrator Results—Table 4.1.2.2.8-1 shows selected data for the centrifugal concentrator unit operation. The centrifugal concentrator was ineffective as a concentrating device for the COCs. There was little difference between the analyses of the feed material and the concentrate. The distribution of metals followed the mass distribution of the two streams.

Table 4.1.2.2.8-1 Centrifugal Concentrator Results

Analyses MG/KG	As	Ba	Be	Cd	Cr	Pb	Se	Stream Fraction
Feed Material (Spiral Classifier Overflow)	19.3	199.7	1.1	1.1	27.5	87.7	22.7	
Concentrate	22.5	191	1.1	1.0	28.8	84.9	22.7	
Tailing	17.3	205	1.2	1.2	26.7	89.3	22.7	
Distribution								
Cocentrate, %	44	44	36	33	39	36	38	0.38
Tailing, %	56	64	64	67	61	64	62	0.62
Note: The shaded areas indicate that the data was calculated for each analyte from the weighted averages of all products.								

4.1.2.2.9 Hydrocyclone Results—Table 4.1.2.2.9-1-1 shows selected data for the hydrocyclone unit operation. The hydrocyclone, like the centrifugal concentrator, was ineffective as a concentrating device for the COCs. There was little difference between the analyses of the feed material and the concentrate. The distribution of metals followed the mass distribution of the two streams. The hydrocyclone, like the spiral classifier, is a processing device used in most applications to make a size separation. The hydrocyclone does not concentrate materials based upon specific gravity differences.

Table 4.1.2.2.9-1 Hydrocyclone Results

Analyses MG/KG	As	Ba	Be	Cd	Cr	Pb	Se	Stream Fraction
Feed Material (Centrifugal Concentration)	17.3	228	1.4	1.2	32.0	101	22.7	
Overflow	17.3	241	1.5	1.1	34.4	111	22.6	
Underflow	17.3	219	1.4	1.3	30.3	93.3	22.7	
Distribution								
Overflow, %	40	43	42	37	44	45	40	0.40
Underflow, %	60	57	58	63	56	55	60	0.60
Note: The shaded area indicates that the data was calculated for each analyte from the weighted averages of all products.								

4.1.2.3 Specific Gravity Values for COC Mineral Specie—Gravity concentration is dependent upon the degree of difference between the specific gravity of the mineral specie that is desired to be concentrated or separated from the larger portion of material having a lower specific gravity. For example, PbS at a specific gravity of 7.5 can be separated from SiO_2 which has a specific gravity of 2.65 using gravity concentrating unit operations. For a gravity concentrating operation to be successful on soil, the specie that are desired to be separated must exist in appropriate mineralogical forms and requires a sufficiently high specific gravity in comparison to the other portion of the material (the bulk portion of the soil).

Table 4.1.2.3-1 contains naturally occurring mineral specie and their corresponding specific gravities for the seven COCs of this study. It should be noted that an extensive literature survey

was not performed with regards to potential mineralogical forms for the identified COCs. According to the reference, not all of the COCs have naturally occurring forms. No extensive mineralogical information is known about the soil feed material used in this study. However, the bulk of the minerals identified as occurring naturally do not exhibit high enough specific gravities to result in successful recovery through gravity concentration techniques. The low separation recoveries experienced in this treatability study would be explained by this interpretation.

Table 4.1.2.3-1 COC Mineral Specific Gravities[1]

Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Selenium
As_2O_3-3.87	$BaCO_3$-4.43	$BeA1_2O_4$-3.76	CdS-4.82	No	$PbCO_3$-6.6	No
As_2O_3-4.15	$BaSO_4$-4.50	BeO-3.01		Natural	PbS-7.5	Natural
As_2S_2-3.35		Be_2SiO_4-3.0		Occurring	$PbSO_4$-6.2	Occurring
		$Be_2(OH)BO_3$-2.35		Listings		Listings

[1]Data from the 75th Edition of the Handbook of Chemistry and Physics, CRC Press, 1994.

4.1.4 Comparison To Test Objectives

The objective of this treatability study was to determine whether the physical separation and gravity concentrating operations that make up the TRU-Clean® Process would effectively remove the seven COCs from RFETS OU2 soil. Results are presented in Table 4.1.2-1, Unit Operations Stream Concentrations and indicate that concentration of the COCs was not effected. Further, soil background data (See Table 4.1.1-1, LESAT Feed, PPRGs, and Rock Creek Study Soil Analyses) for the seven identified COCs are below the PPRGs, indicating that five of the seven elements identified may not be COCs. Arsenic and beryllium may be exceptions.

4.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

In addition to those procedures specified in Section 3.2, Sampling and Analysis, QA/QC were maintained through the use of Sample Management Office (SMO) procedures. Those procedures were: L-8001-A, *SMO Database Input Process* (Effective Date 2/28/94); and L-8000-A, *Sample*

Packaging and Shipping Procedure (Effective Date 1/11/94). Samples were shipped to the analytical facility per Rocky Flats Transportation Safety Manuals, PADC-94-01279.

Duplicates were collected for analysis and all values were within the 20 percent Relative Percent Difference Criteria or within five times the instrument detection limits.

5.0 REFERENCES

Final Phase II RCRA Facility Investigation Remedial Investigation, Work Plan (Alluvial), U.S. Department of Energy, Rocky Flats Office, Golden, Colorado, February 29, 1991.

Hayden, J.A., et al: Rockwell International, "Soil Decontamination Criteria Report," November 1990.

Rocky Flats Plant Soil Treatment Bench-Scale Treatability Studies, Nuclear Remediation Technologies Division, General Atomics-San Diego, California, Georgia, C21818.

Wenstrand, T.K., Murarik, T.M., "Plutonium in Soils Treatability Studies Rocky Flats Plant Operable Unit 2," Lockheed Environmental Systems & Technologies, Inc., March 31, 1994.

Appendix A

Acronym List

As	Arsenic
Ba	Barium
Be	Beryllium
BSCP	Background Soils Characterization Plan
Cd	Cadmium
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cm2	square centimeters
Cr	Chromium
COC	Contaminants of Concern
DOE	Department of Energy
dpm	Disentegrations per Minute
EPA	Environmental Protection Agency
LESAT	Lockheed Environmental Services and Technology
MG/KG	milligram/kilogram
OU	Operable Unit
OWSER	Office of Solid Waste and Emergency Response
Pb	Lead
PPRG	Programmatic Risk-based Preliminary Remediation Goal
RCRA	Resource Conservation and Recovery Act
RFEDS	Rocky Flats Environmental Database System
RFETS	Rocky Flats Environmental Technology Site
RFFO	Rocky Flats Field Office
Se	Selenium
TRU	Transuranic Waste
TSP	Total Suspended Particulates
UBK	Uptake Biokinetic

Appendix B

Data Summaries

EG&G ROCKY FLATS

INTEROFFICE CORRESPONDENCE

DATE: January 8, 1993

TO: O. Erlich, Environmental Science and Engineering, Bldg. 51, 273-6110

FROM: P. A. Kiefer, Sample Management, Bldg. 080, X8698 Kiefer

SUBJECT: SAMPLE NUMBERS AND LOCATION CODES FOR SITEWIDE TREATABILITY STUDY TRU- CLEAN - PAK-002-93

Please direct your Woodward-Clyde sampling crews to use the following location codes and sample numbers for the surficial soil samples collected for Sitewide Treatability Study TRU-CLEAN.

LOCATION CODES:

SS000193 and SS000293

SAMPLE NUMBER BLOCK OF NUMBERS: Block 55

SS00500WC through SS00520WC

If you require additional numbers, then contact me.

klb

cc: WSB
W. S. Busby
C. Sundberg
D. Scruggs

Analytical DATA - March 3,1994

	ST	MATRIX	QC	Sample Number	Smpl Date	Anal Date	ID	2ID	Group	Chemical	Result	Unit	Error	Qual	D.LMT	VA	RN1	RN2	RN3	RN4
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	1,1,1-TRICHLOROETHANE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	1,1,2,2-TETRACHLOROETHANE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	1,1,2-TRICHLOROETHANE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	1,1-DICHLOROETHANE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	1,1-DICHLOROETHENE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	1,2,4-TRICHLOROBENZENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	1,2-DICHLOROBENZENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	1,2-DICHLOROETHANE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	1,2-DICHLOROETHENE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	1,2-DICHLOROPROPANE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	1,3-DICHLOROBENZENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	1,4-DICHLOROBENZENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2,4,5-TRICHLOROPHENOL	1800	UG/KG		U	1600	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2,4,6-TRICHLOROPHENOL	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2,4-DICHLOROPHENOL	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2,4-DIMETHYLPHENOL	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2,4-DINITROPHENOL	1800	UG/KG		U	1600	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2,4-DINITROTOLUENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2,6-DINITROTOLUENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	2-BUTANONE	11	UG/KG		U	10	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2-CHLORONAPHTHALENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2-CHLOROPHENOL	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	2-HEXANONE	11	UG/KG		U	10	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2-METHYLNAPHTHALENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2-METHYLPHENOL	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2-NITROANILINE	1800	UG/KG		U	1600	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	2-NITROPHENOL	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	3,3'-DICHLOROBENZIDINE	750	UG/KG		U	660	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	3-NITROANILINE	1800	UG/KG		U	1600	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	4,6-DINITRO-2-METHYLPHENO	1800	UG/KG		U	1600	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	4-CHLORO-3-METHYLPHENOL	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	4-CHLOROANILINE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	4-CHLOROPHENYL PHENYL ETH	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	4-METHYL-2-PENTANONE	11	UG/KG		U	10	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	4-METHYLPHENOL	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	4-NITROANILINE	1800	UG/KG		U	1600	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	4-NITROPHENOL	1800	UG/KG		U	1600	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	ACENAPHTHENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	ACENAPHTHYLENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	ACETONE	31	UG/KG		U	10	JA	49	1		
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	ALUMINUM	9170	MG/KG			40	V				
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	ANTHRACENE	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	ANTIMONY	14.8	MG/KG			12	JA	12			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	ARSENIC	3.5	MG/KG			2	JA	12			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	BARIUM	102	MG/KG			40	JA	12	11		
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	BENZENE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BENZO(a)ANTHRACENE	370	UG/KG		J	330	A	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BENZO(a)PYRENE	440	UG/KG			330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BENZO(b)FLUORANTHENE	570	UG/KG			330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BENZO(ghi)PERYLENE	360	UG/KG		J	330	A	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BENZO(k)FLUORANTHENE	140	UG/KG		J	330	A	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BENZOIC ACID	1800	UG/KG		U	1600	JA	1			

	ST	MATRIX	QC	Sample Number	Smpl Date	Anal Date	ID	2ID	Group	Chemical	Result	Unit	Error	Qual	D.LMT	VA	RN1	RN2	RN3	RN4
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BENZYL ALCOHOL	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	BERYLLIUM	.63	MG/KG		U	1	JA	7			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BIS(2-CHLOROETHOXY)METHAN	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BIS(2-CHLOROETHYL)ETHER	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BIS(2-CHLOROISOPROPYL)ETH	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BIS(2-ETHYLHEXYL)PHTHALAT	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	BROMODICHLOROMETHANE	6	UG/KG		U	5	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	BROMOFORM	6	UG/KG		U	5	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	BROMOMETHANE	11	UG/KG		U	10	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	BUTYL BENZYL PHTHALATE	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	CADMIUM	.78	MG/KG		U	1	JA	7			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	CALCIUM	11800	MG/KG			1000	V				
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	CARBON DISULFIDE	6	UG/KG		U	5	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	CARBON TETRACHLORIDE	6	UG/KG		U	5	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	12-JUL-93	TRG		METADD	CESIUM	6.9	MG/KG		U	200	JA	10			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	CHLOROBENZENE	6	UG/KG		U	5	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	CHLOROETHANE	11	UG/KG		U	10	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	CHLOROFORM	6	UG/KG		U	5	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	CHLOROMETHANE	11	UG/KG		U	10	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	CHROMIUM	8.5	MG/KG			2	V				
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	CHRYSENE	490	UG/KG			330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	COBALT	6.3	MG/KG		B	10	V				
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	COPPER	12.8	MG/KG			5	V				
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	DI-n-BUTYL PHTHALATE	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	DI-n-OCTYL PHTHALATE	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	DIBENZO(a,h)ANTHRACENE	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	DIBENZOFURAN	370	UG/KG		U	330	JA	1			
)00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	DIBROMOCHLOROMETHANE	6	UG/KG		U	5	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	DIETHYL PHTHALATE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	DIMETHYL PHTHALATE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	ETHYLBENZENE	6	UG/KG		U	5	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	FLUORANTHENE	630	UG/KG			330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	FLUORENE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	HEXACHLOROBENZENE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	HEXACHLOROBUTADIENE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	HEXACHLOROCYCLOPENTADIENE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	HEXACHLOROETHANE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	INDENO(1,2,3-cd)PYRENE	290	UG/KG		J	330	A	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	IRON	10200	MG/KG			20	V				
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	ISOPHORONE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	25-JUN-93	DIL		SMETCLP	LEAD	26.9	MG/KG			1	JA	12			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	23-JUN-93	TRG		METADD	LITHIUM	7.5	MG/KG		B	20	JA	10			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	MAGNESIUM	2370	MG/KG			1000	V				
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	MANGANESE	241	MG/KG			3	JA	11			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	MERCURY	.06	MG/KG		U	.1	V				
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	METHYLENE CHLORIDE	6	UG/KG		U	5	JA	49	1		
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		METADD	MOLYBDENUM	1.5	MG/KG		U	40	V				
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	N-NITROSO-DI-n-PROPYLAMIN	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	N-NITROSODIPHENYLAMINE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	NAPHTHALENE	370	UG/KG		U	330	JA	1			
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	NICKEL	9.9	MG/KG			8	V				
000193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	NITROBENZENE	370	UG/KG		U	330	JA	1			

Analytical DATA - March 3,1994

	ST	MATRIX	QC	Sample Number	Smpl Date	Anal Date	ID	2ID	Group	Chemical	Result	Unit	Error	Qual	D.LMT	VA	RN1	RN2	RN3	RN4
)0193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	PENTACHLOROPHENOL	1800	UG/KG		U	1600	JA	1			
)0193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	PHENANTHRENE	190	UG/KG		J	330	A	1			
)0193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	PHENOL	370	UG/KG		U	330	JA	1			
)0193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	POTASSIUM	1750	MG/KG			1000	V				
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	PYRENE	620	UG/KG			330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	23-JUN-93	TRG		SMETCLP	SELENIUM	.47	MG/KG		U	1	JA	7			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	SILVER	.8	MG/KG		U	2	JA	5			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	SODIUM	425	MG/KG		B	1000	V				
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		METADD	STRONTIUM	28.3	MG/KG		B	40	JA	10			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	STYRENE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	TETRACHLOROETHENE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	23-JUN-93	TRG		SMETCLP	THALLIUM	.24	MG/KG		B	2	V				
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		METADD	TIN	7.6	MG/KG		U	40	JA	10	8		
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	TOLUENE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	TOTAL XYLENES	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	TRICHLOROETHENE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown C18H28	520	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-1	340	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-10	3600	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-13	7200	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-14	3800	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-15	1200	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-16	750	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-18	1400	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-19	600	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-3	950	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-5	210	UG/KG		BJ						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-7	740	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TIC	TIC	BNACLP	Unknown-9	390	UG/KG		J						
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	VANADIUM	30	MG/KG			10	V				
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	VINYL ACETATE	11	UG/KG		U	10	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	VINYL CHLORIDE	11	UG/KG		U	10	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	24-JUN-93	TRG		SMETCLP	ZINC	43.5	MG/KG			4	JA	17			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	cis-1,3-DICHLOROPROPENE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	29-JUN-93	TRG		BNACLP	p-BROMODIPHENYL ETHER	370	UG/KG		U	330	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	17-JUN-93	TRG		VOACLP	trans-1,3-DICHLOROPROPENE	6	UG/KG		U	5	JA	1			
00193	SS	SOIL	REAL	TT00001LE	02-JUN-93	20-JUL-93	TRG		TRADS	AMERICIUM-241	17.88	PCI/G	1.76		.0039					
00193	SS	SED	REAL	TT00002LE	02-JUN-93	18-JUN-93	TRG		TRADS	GROSS ALPHA	123.1	PCI/G	23.1		2.902	A	31	32		
00193	SS	SED	REAL	TT00002LE	02-JUN-93	17-JUN-93	TRG		TRADS	GROSS BETA	32.89	PCI/G	3.69		2.296	A	31	32		
000193	TT	SOIL	REAL	TT00189LE	27-JUL-93	30-AUG-93	TRG		TRADS	AMERICIUM-241	7.9	PCI/G	1.68		.0044	A	18			
000193	TT	SOIL	REAL	TT00189LE	27-JUL-93	17-SEP-93	TRG		TRADS	PLUTONIUM-238	1.05	PCI/G	.39		.066	Z				
000193	TT	SOIL	REAL	TT00189LE	27-JUL-93	17-SEP-93	TRG		TRADS	PLUTONIUM-239/240	57.1	PCI/G	11.9		.066	A	18	31	21	
000193	TT	SOIL	REAL	TT00189LE	27-JUL-93	25-AUG-93	TRG		TRADS	URANIUM-233,-234	.685	PCI/G	.176		.048	A	18	62		
000193	TT	SOIL	REAL	TT00189LE	27-JUL-93	25-AUG-93	TRG		TRADS	URANIUM-235	.0222	PCI/G	.0204		.012	A	18	62		
000193	TT	SOIL	REAL	TT00189LE	27-JUL-93	25-AUG-93	TRG		TRADS	URANIUM-238	.876	PCI/G	.216		.036	A	18	21	62	
000193	TT	SOIL	REAL	TT00190LE	29-JUL-93	30-AUG-93	TRG		TRADS	AMERICIUM-241	8.84	PCI/G	1.87		.0042	A	18			
000193	TT	SOIL	REAL	TT00190LE	29-JUL-93	25-AUG-93	TRG		TRADS	URANIUM-233,-234	.837	PCI/G	.22		.034	A	18	62		
000193	TT	SOIL	REAL	TT00190LE	29-JUL-93	09-SEP-93	REX		TRADS	URANIUM-233,-234	.611	PCI/G	.185		.074	A	18	62		
000193	TT	SOIL	REAL	TT00190LE	29-JUL-93	25-AUG-93	TRG		TRADS	URANIUM-235	.0591	PCI/G	.0412		.035	A	18	62		
000193	TT	SOIL	REAL	TT00190LE	29-JUL-93	09-SEP-93	REX		TRADS	URANIUM-235	.0173	PCI/G	.0248		.023	A	18	62		
000193	TT	SOIL	REAL	TT00190LE	29-JUL-93	25-AUG-93	TRG		TRADS	URANIUM-238	1.02	PCI/G	.26		.034	A	18	62		
000193	TT	SOIL	REAL	TT00190LE	29-JUL-93	09-SEP-93	REX		TRADS	URANIUM-238	.669	PCI/G	.198		.074	A	18	21	62	

	ST	MATRIX	QC	Sample Number	Smpl Date	Anal Date	ID	2ID	Group	Chemical	Result	Unit	Error	Qual	D.LMT	VA	RN1	RN2	RN3	RN4
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	1,1,1-TRICHLOROETHANE	5	UG/KG		U	5	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	1,1,2,2-TETRACHLOROETHANE	5	UG/KG		U	5	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	1,1,2-TRICHLOROETHANE	5	UG/KG		U	5	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	1,1-DICHLOROETHANE	5	UG/KG		U	5	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	1,1-DICHLOROETHENE	5	UG/KG		U	5	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	1,2,4-TRICHLOROBENZENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	1,2-DICHLOROBENZENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	1,2-DICHLOROETHANE	5	UG/KG		U	5	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	1,2-DICHLOROETHENE	5	UG/KG		U	5	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	1,2-DICHLOROPROPANE	5	UG/KG		U	5	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	1,3-DICHLOROBENZENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	1,4-DICHLOROBENZENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2,4,5-TRICHLOROPHENOL	1700	UG/KG		U	1600	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2,4,6-TRICHLOROPHENOL	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2,4-DICHLOROPHENOL	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2,4-DIMETHYLPHENOL	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2,4-DINITROPHENOL	1700	UG/KG		U	1600	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2,4-DINITROTOLUENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2,6-DINITROTOLUENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	2-BUTANONE	11	UG/KG		U	10	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2-CHLORONAPHTHALENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2-CHLOROPHENOL	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	2-HEXANONE	11	UG/KG		U	10	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2-METHYLNAPHTHALENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2-METHYLPHENOL	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2-NITROANILINE	1700	UG/KG		U	1600	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	2-NITROPHENOL	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	3,3'-DICHLOROBENZIDINE	700	UG/KG		U	660	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	3-NITROANILINE	1700	UG/KG		U	1600	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	4,6-DINITRO-2-METHYLPHENO	1700	UG/KG		U	1600	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	4-CHLORO-3-METHYLPHENOL	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	4-CHLOROANILINE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	4-CHLOROPHENYL PHENYL ETH	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	4-METHYL-2-PENTANONE	11	UG/KG		U	10	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	4-METHYLPHENOL	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	4-NITROANILINE	1700	UG/KG		U	1600	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	4-NITROPHENOL	1700	UG/KG		U	1600	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	ACENAPHTHENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	ACENAPHTHYLENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	ACETONE	36	UG/KG		U	10	JA	49			
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	25-AUG-93	TRG		SMETCLP	ALUMINUM	4360	MG/KG			40	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	ANTHRACENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	25-AUG-93	TRG		SMETCLP	ANTIMONY	5.4	MG/KG		U	12	JA	12			
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	13-SEP-93	TRG		SMETCLP	ARSENIC	3.5	MG/KG			2.0	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TIC	TIC	BNACLP	Aldol Condensation	19000	UG/KG		AJ						
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	25-AUG-93	TRG		SMETCLP	BARIUM	79.4	MG/KG			40	JA	12	11		
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	10-AUG-93	TRG		VOACLP	BENZENE	5	UG/KG		U	5	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	BENZO(a)ANTHRACENE	52	UG/KG		J	330	A				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	BENZO(a)PYRENE	47	UG/KG		J	330	A				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	BENZO(b)FLUORANTHENE	62	UG/KG		J	330	A				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	BENZO(ghi)PERYLENE	350	UG/KG		U	330	V				
00193	TT	SOIL	REAL	TT00191LE	29-JUL-93	27-AUG-93	TRG		BNACLP	BENZO(k)FLUORANTHENE	350	UG/KG		U	330	V				

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INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.: C023702

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 810RFW SAS No.: _____ SDG No.: L2608S

Matrix (soil/water): SOIL Lab Sample ID: L2608-2

Level (low/med): LOW Date Received: 08/10/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10700			P
7440-36-0	Antimony				NR
7440-38-2	Arsenic	62.1	U		P
7440-39-3	Barium	128			P
7440-41-7	Beryllium	0.60	B		P
7440-43-9	Cadmium	1.4			P
7440-70-2	Calcium	15200			P
7440-47-3	Chromium	11.0			P
7440-48-4	Cobalt	7.5	B		P
7440-50-8	Copper	36.0			P
7439-89-6	Iron	9020			P
7439-92-1	Lead	56.5			P
7439-95-4	Magnesium	2490			P
7439-96-5	Manganese	281			P
7439-97-6	Mercury	0.05	U		AV
7440-02-0	Nickel	13.1			P
7440-09-7	Potassium	2370			P
7782-49-2	Selenium	1.3		W	F
7440-22-4	Silver	1.4	U		P
7440-23-5	Sodium	1000			P
7440-28-0	Thallium	0.80	U		F
7440-62-2	Vanadium	21.1			P
7440-66-6	Zinc	63.7			P

DRAFT

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments: DRY SCREEN ORGANIC

FORM I - IN

SW - 846

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

C023502

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 810RFW SAS No.: _____ SDG No.: L2608S

Matrix (soil/water): SOIL Lab Sample ID: L2608-7

Level (low/med): LOW Date Received: 08/10/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	533			P
7440-36-0	Antimony				NR
7440-38-2	Arsenic	58.3	U		P
7440-39-3	Barium	4.5	B		P
7440-41-7	Beryllium	0.19	U		P
7440-43-9	Cadmium	0.75	U		P
7440-70-2	Calcium	385	B		P
7440-47-3	Chromium	2.6			P
7440-48-4	Cobalt	1.9	U		P
7440-50-8	Copper	2.7	B		P
7439-89-6	Iron	2270			P
7439-92-1	Lead	16.2	U		P
7439-95-4	Magnesium	81.7	B		P
7439-96-5	Manganese	13.4			P
7439-97-6	Mercury	0.05	U		AV
7440-02-0	Nickel	2.3	U		P
7440-09-7	Potassium	188	U		P
7782-49-2	Selenium	0.72	B	W	F
7440-22-4	Silver	1.3	U		P
7440-23-5	Sodium	325	B		P
7440-28-0	Thallium	0.80	U	W	F
7440-62-2	Vanadium	6.7	B		P
7440-66-6	Zinc	4.5			P

DRAFT

Color Before: BROWN Clarity Before: _____ Texture: COURSE

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments: DRY SCREEN OVERSIZE NO 1

FORM I - IN

SW - 846

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

C023602

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 810RFW SAS No.: SDG No.: L2608S

Matrix (soil/water): SOIL Lab Sample ID: L2608-6

Level (low/med): LOW Date Received: 08/10/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3380			P
7440-36-0	Antimony				NR
7440-38-2	Arsenic	61.3	U		P
7440-39-3	Barium	222			P
7440-41-7	Beryllium	0.34	B		P
7440-43-9	Cadmium	0.79	U		P
7440-70-2	Calcium	279000			P
7440-47-3	Chromium	3.4			P
7440-48-4	Cobalt	2.0	U		P
7440-50-8	Copper	6.5			P
7439-89-6	Iron	1960			P
7439-92-1	Lead	17.0	U		P
7439-95-4	Magnesium	3510			P
7439-96-5	Manganese	112			P
7439-97-6	Mercury	0.05	U		AV
7440-02-0	Nickel	2.6	B		P
7440-09-7	Potassium	723	B		P
7782-49-2	Selenium	0.60	U	W	F
7440-22-4	Silver	1.4	U		P
7440-23-5	Sodium	707	B		P
7440-28-0	Thallium	0.80	U		F
7440-62-2	Vanadium	8.2	B		P
7440-66-6	Zinc	44.5			P

DRAFT

Color Before: BROWN Clarity Before: Texture: COURSE

Color After: YELLOW Clarity After: Artifacts:

Comments: Dry Screen Oversize No 2

FORM I - IN

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.: C024202

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 810RFW SAS No.: _____ SDG No.: L2608S

Matrix (soil/water): SOIL Lab Sample ID: L2608-1

Level (low/med): LOW Date Received: 08/10/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	12800			P
7440-36-0	Antimony				NR
7440-38-2	Arsenic	61.9	U		P
7440-39-3	Barium	112			P
7440-41-7	Beryllium	0.78	B		P
7440-43-9	Cadmium	0.80	U		P
7440-70-2	Calcium	11300			P
7440-47-3	Chromium	12.2			P
7440-48-4	Cobalt	4.8	B		P
7440-50-8	Copper	13.9			P
7439-89-6	Iron	11000			P
7439-92-1	Lead	37.5			P
7439-95-4	Magnesium	2490			P
7439-96-5	Manganese	229			P
7439-97-6	Mercury	0.05	U		AV
7440-02-0	Nickel	11.6			P
7440-09-7	Potassium	2790			P
7782-49-2	Selenium	0.90	B		F
7440-22-4	Silver	1.4	U		P
7440-23-5	Sodium	628	B		P
7440-28-0	Thallium	0.80	U		F
7440-62-2	Vanadium	22.9			P
7440-66-6	Zinc	49.1			P

DRAFT

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments: DRY SCREEN UNDERSIZE

SW - 846

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

94T022501

ab Name: L.A.S. Contract: ROCKY_FLAT

ab Code: LOCK Case No.: 615RFW SAS No.: SDG No.: L2134S

atrix (soil/water): SOIL Lab Sample ID: L2134-6

evel (low/med): LOW Date Received: 06/15/94

Solids: 100.0

A3878

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	35.4	B	*	P
7440-36-0	Antimony	6.8	U		P
7440-38-2	Arsenic	17.1	U		P
7440-39-3	Barium	7.4	U		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.80	U		P
7440-70-2	Calcium	153	B	*	P
7440-47-3	Chromium	0.99	U		P
7440-48-4	Cobalt	2.2	U		P
7440-50-8	Copper	0.99	U		P
7439-89-6	Iron	120		*	P
7439-92-1	Lead	8.4	U		P
7439-95-4	Magnesium	17.7	U		P
7439-96-5	Manganese	1.2	B	*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	2.6	U		P
7440-09-7	Potassium	96.1	U		P
7782-49-2	Selenium	22.5	U		P
7440-22-4	Silver	0.99	U		P
7440-23-5	Sodium	239	B		P
7440-24-6	Strontium	1.3		*	P
7440-28-0	Thallium	99.4	U		P
7440-62-2	Vanadium	2.0	U		P
7440-66-6	Zinc	3.3	B		P

Color Before: GREY Clarity Before: Texture: COARSE

Color After: COLORLESS Clarity After: Artifacts:

Comments: TROMMEL OVER SIZE

FORM I - IN

037

SW - 846

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

C023902

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 810RFW SAS No.: SDG No.: L2608S

Matrix (soil/water): SOIL Lab Sample ID: L2608-4

Level (low/med): LOW Date Received: 08/10/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7510			P
7440-36-0	Antimony				NR
7440-38-2	Arsenic	61.8	U		P
7440-39-3	Barium	73.2			P
7440-41-7	Beryllium	0.42	B		P
7440-43-9	Cadmium	0.80	U		P
7440-70-2	Calcium	29700			P
7440-47-3	Chromium	8.2			P
7440-48-4	Cobalt	3.0	B		P
7440-50-8	Copper	50.8			P
7439-89-6	Iron	11600			P
7439-92-1	Lead	55.0			P
7439-95-4	Magnesium	2160			P
7439-96-5	Manganese	144			P
7439-97-6	Mercury	0.06			AV
7440-02-0	Nickel	14.2			P
7440-09-7	Potassium	1330			P
7782-49-2	Selenium	0.78	B	W	F
7440-22-4	Silver	1.4	U		P
7440-23-5	Sodium	1720			P
7440-28-0	Thallium	0.80	U		F
7440-62-2	Vanadium	12.5			P
7440-66-6	Zinc	62.0			P

DRAFT

Color Before: GREY Clarity Before: Texture: COURSE

Color After: YELLOW Clarity After: Artifacts:

Comments: ROMMEL UNDER SIZE

FORM I - IN

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.: 94T022701

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 615RFW SAS No.: _____ SDG No.: L2134S

Matrix (soil/water): SOIL Lab Sample ID: L2134-8

Level (low/med): LOW Date Received: 06/15/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4950		*	P
7440-36-0	Antimony	6.8	U		P
7440-38-2	Arsenic	17.3	U		P
7440-39-3	Barium	59.0			P
7440-41-7	Beryllium	0.31	B		P
7440-43-9	Cadmium	0.81	U		P
7440-70-2	Calcium	7340		*	P
7440-47-3	Chromium	6.5			P
7440-48-4	Cobalt	2.7	B		P
7440-50-8	Copper	24.8			P
7439-89-6	Iron	4340		*	P
7439-92-1	Lead	25.1			P
7439-95-4	Magnesium	1460			P
7439-96-5	Manganese	120		*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	7.9	B		P
7440-09-7	Potassium	1250			P
7782-49-2	Selenium	22.8	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1380			P
7440-24-6	Strontium	34.7		*	P
7440-28-0	Thallium	101	U		P
7440-62-2	Vanadium	10.4			P
7440-66-6	Zinc	43.9			P

Color Before: BLACK Clarity Before: _____ Texture: COARSE

Color After: YELLOW Clarity After: _____ Artifacts: YES

Comments:
GRASS, ROOTS AND STEMS Wet Screen Oversize

FORM I - IN

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.: 94T023101

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 615RFW SAS No.: _____ SDG No.: L2134S

Matrix (soil/water): SOIL Lab Sample ID: L2134-11

Level (low/med): LOW Date Received: 06/15/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1330		*	P
7440-36-0	Antimony	13.3			P
7440-38-2	Arsenic	17.2	U		P
7440-39-3	Barium	21.3	B		P
7440-41-7	Beryllium	0.29	B		P
7440-43-9	Cadmium	0.80	U		P
7440-70-2	Calcium	2000		*	P
7440-47-3	Chromium	4.5			P
7440-48-4	Cobalt	2.2	U		P
7440-50-8	Copper	6.3			P
7439-89-6	Iron	10500		*	P
7439-92-1	Lead	377			P
7439-95-4	Magnesium	475	B		P
7439-96-5	Manganese	178		*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	4.1	B		P
7440-09-7	Potassium	227	B		P
7782-49-2	Selenium	22.6	U		P
7440-22-4	Silver	1.00	U		P
7440-23-5	Sodium	314	B		P
7440-24-6	Strontium	9.9		*	P
7440-28-0	Thallium	99.8	U		P
7440-62-2	Vanadium	22.9			P
7440-66-6	Zinc	14.4			P

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments: HUTCH 1 TABLE CONC

FORM I - IN

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.: 94T022601

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 615RFW SAS No.: _____ SDG No.: L21348

Matrix (soil/water): SOIL Lab Sample ID: L2134-7

Level (low/mad): LOW Date Received: 06/15/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1110		*	P
7440-36-0	Antimony	8.8	B		P
7440-38-2	Arsenic	17.3	U		P
7440-39-3	Barium	12.7	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.80	U		P
7440-70-2	Calcium	3670		*	P
7440-47-3	Chromium	2.3			P
7440-48-4	Cobalt	2.2	U		P
7440-50-8	Copper	4.5	B		P
7439-89-6	Iron	2730		*	P
7439-92-1	Lead	10.9			P
7439-95-4	Magnesium	374	B		P
7439-96-5	Manganese	37.4		*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	2.6	U		P
7440-09-7	Potassium	351	B		P
7782-49-2	Selenium	22.7	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	262	B		P
7440-24-6	Strontium	9.0		*	P
7440-28-0	Thallium	100	U		P
7440-62-2	Vanadium	6.5	B		P
7440-66-6	Zinc	10.5			P

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments: HATCH 1 TABLE TAIL

FORM I - IN

SW - 846

1

INORGANIC ANALYSES DATA SHEET

#3803 CLIENT ID NO.

94T023201

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 615RFW SAS No.: _____ SDG No.: L2134S

Matrix (soil/water): SOIL Lab Sample ID: L2134-12

Level (low/med): LOW Date Received: 06/15/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1300		*	P
7440-36-0	Antimony	8.8	B		P
7440-38-2	Arsenic	17.3	U		P
7440-39-3	Barium	14.5	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.80	U		P
7440-70-2	Calcium	3130		*	P
7440-47-3	Chromium	3.3			P
7440-48-4	Cobalt	2.2	U		P
7440-50-8	Copper	6.5			P
7439-89-6	Iron	3310		*	P
7439-92-1	Lead	18.8			P
7439-95-4	Magnesium	410	B		P
7439-96-5	Manganese	41.4		*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	4.1	B		P
7440-09-7	Potassium	331	B		P
7782-49-2	Selenium	22.7	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	351	B		P
7440-24-6	Strontium	9.6		*	P
7440-28-0	Thallium	101	U		P
7440-62-2	Vanadium	8.3	B		P
7440-66-6	Zinc	11.4			P

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments: Hutch 2. Table Conc

FORM I - IN

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.: C024402

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 810RFW SAS No.: _____ SDG No.: L2608S

Matrix (soil/water): SOIL Lab Sample ID: L2608-3

Level (low/med): LOW Date Received: 08/10/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8090			P
7440-36-0	Antimony				NR
7440-38-2	Arsenic	61.4	U		P
7440-39-3	Barium	74.3			P
7440-41-7	Beryllium	0.38	B		P
7440-43-9	Cadmium	0.79	U		P
7440-70-2	Calcium	11200			P
7440-47-3	Chromium	10.9			P
7440-48-4	Cobalt	5.1	B		P
7440-50-8	Copper	6.8			P
7439-89-6	Iron	6200			P
7439-92-1	Lead	17.0	U		P
7439-95-4	Magnesium	2540			P
7439-96-5	Manganese	116			P
7439-97-6	Mercury	0.05	U		AV
7440-02-0	Nickel	7.0	B		P
7440-09-7	Potassium	1640			P
7782-49-2	Selenium	0.60	U		F
7440-22-4	Silver	1.4	U		P
7440-23-5	Sodium	566	B		P
7440-28-0	Thallium	0.80	U		F
7440-62-2	Vanadium	15.9			P
7440-66-6	Zinc	18.6			P

DRAFT

Color Before: GREY Clarity Before: _____ Texture: FINE

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments: HUTCH 2 TABLE TAIL

FORM I - IN

SW - 846

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

94T022801

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 615RFW SAS No.: SDG No.: L21348

Matrix (soil/water): SOIL Lab Sample ID: L2134-9

Level (low/med): LOW Date Received: 06/15/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1780		*	P
7440-36-0	Antimony	6.8	U		P
7440-38-2	Arsenic	17.1	U		P
7440-39-3	Barium	23.7	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.80	U		P
7440-70-2	Calcium	3210		*	P
7440-47-3	Chromium	2.8			P
7440-48-4	Cobalt	2.2	U		P
7440-50-8	Copper	8.1			P
7439-89-6	Iron	3550		*	P
7439-92-1	Lead	25.3			P
7439-95-4	Magnesium	569	B		P
7439-96-5	Manganese	58.1		*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	4.6	B		P
7440-09-7	Potassium	427	B		P
7782-49-2	Selenium	22.5	U		P
7440-22-4	Silver	0.99	U		P
7440-23-5	Sodium	346	B		P
7440-24-6	Strontium	11.5		*	P
7440-28-0	Thallium	99.4	U		P
7440-62-2	Vanadium	7.7	B		P
7440-66-6	Zinc	14.5			P

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments: CLASSIFIER CLEANOUT - ORGANIC

FORM I - IN

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

94T022901

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 615RFW SAS No.: SDG No.: L21348

Matrix (soil/water): SOIL Lab Sample ID: L2134-5

Level (low/med): LOW Date Received: 06/15/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	225		*	P
7440-36-0	Antimony	6.8	U		P
7440-38-2	Arsenic	17.3	U		P
7440-39-3	Barium	18.5	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.80	U		P
7440-70-2	Calcium	11700		*	P
7440-47-3	Chromium	2.3			P
7440-48-4	Cobalt	2.2	U		P
7440-50-8	Copper	2.3	B		P
7439-89-6	Iron	2560		*	P
7439-92-1	Lead	8.4	U		P
7439-95-4	Magnesium	204	B		P
7439-96-5	Manganese	59.1		*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	2.6	U		P
7440-09-7	Potassium	97.1	U		P
7782-49-2	Selenium	22.7	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	238	B		P
7440-24-6	Strontium	19.8		*	P
7440-28-0	Thallium	100	U		P
7440-62-2	Vanadium	11.5			P
7440-66-6	Zinc	12.3			P

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: COLORLESS Clarity After: Artifacts:

Comments: CLASSIFIER UNDERFLOW

FORM I - IN

INORGANIC ANALYSES DATA SHEET

A30°7 CLIENT ID NO.

94T023301

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 615RFW SAS No.: _____ SDG No.: L2134S

Matrix (soil/water): SOIL Lab Sample ID: L2134-1

Level (low/med): LOW Date Received: 06/15/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	18500		*	P
7440-36-0	Antimony	6.9	B		P
7440-38-2	Arsenic	22.5			P
7440-39-3	Barium	191			P
7440-41-7	Beryllium	1.1			P
7440-43-9	Cadmium	1.0			P
7440-70-2	Calcium	18300		*	P
7440-47-3	Chromium	28.8			P
7440-48-4	Cobalt	8.8	B		P
7440-50-8	Copper	45.6			P
7439-89-6	Iron	18500		*	P
7439-92-1	Lead	84.9			P
7439-95-4	Magnesium	4570			P
7439-96-5	Manganese	424		*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	27.3			P
7440-09-7	Potassium	4080			P
7782-49-2	Selenium	22.7	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1220			P
7440-24-6	Strontium	73.9		*	P
7440-28-0	Thallium	100	U		P
7440-62-2	Vanadium	30.9			P
7440-66-6	Zinc	137			P

Color Before: GREY Clarity Before: _____ Texture: COARSE

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments: CENTRIFUGAL CONC

FORM I - IN

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.: 94T023601

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 615RFW SAS No.: _____ SDG No.: L2134S

Matrix (soil/water): SOIL Lab Sample ID: L2134-3

Level (low/med): LOW Date Received: 06/15/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	23800		*	P
7440-36-0	Antimony	13.5			P
7440-38-2	Arsenic	17.2	U		P
7440-39-3	Barium	241			P
7440-41-7	Beryllium	1.5			P
7440-43-9	Cadmium	1.1			P
7440-70-2	Calcium	22300		*	P
7440-47-3	Chromium	34.4			P
7440-48-4	Cobalt	9.7	B		P
7440-50-8	Copper	58.8			P
7439-89-6	Iron	22600		*	P
7439-92-1	Lead	111			P
7439-95-4	Magnesium	5630			P
7439-96-5	Manganese	522		*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	32.9			P
7440-09-7	Potassium	5260			P
7782-49-2	Selenium	22.6	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	2840			P
7440-24-6	Strontium	83.2		*	P
7440-28-0	Thallium	100	U		P
7440-62-2	Vanadium	34.9			P
7440-66-6	Zinc	162			P

Color Before: BLACK Clarity Before: _____ Texture: COARSE

Color After: YELLOW Clarity After: _____ Artifacts: YES

Comments:
ROCK_SLIVERS HYDROCYCLONE OVERFLOW

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SW - 846

1

INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.: 94T023801

Lab Name: L.A.S. Contract: ROCKY_FLAT

Lab Code: LOCK Case No.: 615RFW SAS No.: SDG No.: L2134S

Matrix (soil/water): SOIL Lab Sample ID: L2134-15

Level (low/med): LOW Date Received: 06/15/94

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21400		*	P
7440-36-0	Antimony	11.5	B		P
7440-38-2	Arsenic	17.3	U		P
7440-39-3	Barium	219			P
7440-41-7	Beryllium	1.4			P
7440-43-9	Cadmium	1.3			P
7440-70-2	Calcium	22900		*	P
7440-47-3	Chromium	30.3			P
7440-48-4	Cobalt	10.1			P
7440-50-8	Copper	45.9			P
7439-89-6	Iron	21300		*	P
7439-92-1	Lead	93.3			P
7439-95-4	Magnesium	5310			P
7439-96-5	Manganese	498		*	P
7439-98-7	Molybdenu	5.2	U		P
7440-02-0	Nickel	30.8			P
7440-09-7	Potassium	4550			P
7782-49-2	Selenium	22.7	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1990			P
7440-24-6	Strontium	79.5		*	P
7440-28-0	Thallium	100	U		P
7440-62-2	Vanadium	36.7			P
7440-66-6	Zinc	141			P

Color Before: BLACK Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments: HYDROCYCLONE UNDERFLOW

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